



CENTER FOR GEOGRAPHIC ANALYSIS
HARVARD UNIVERSITY

Mapping Tabular Data

Problem: The available data is somehow not in the right form to create the map you want.

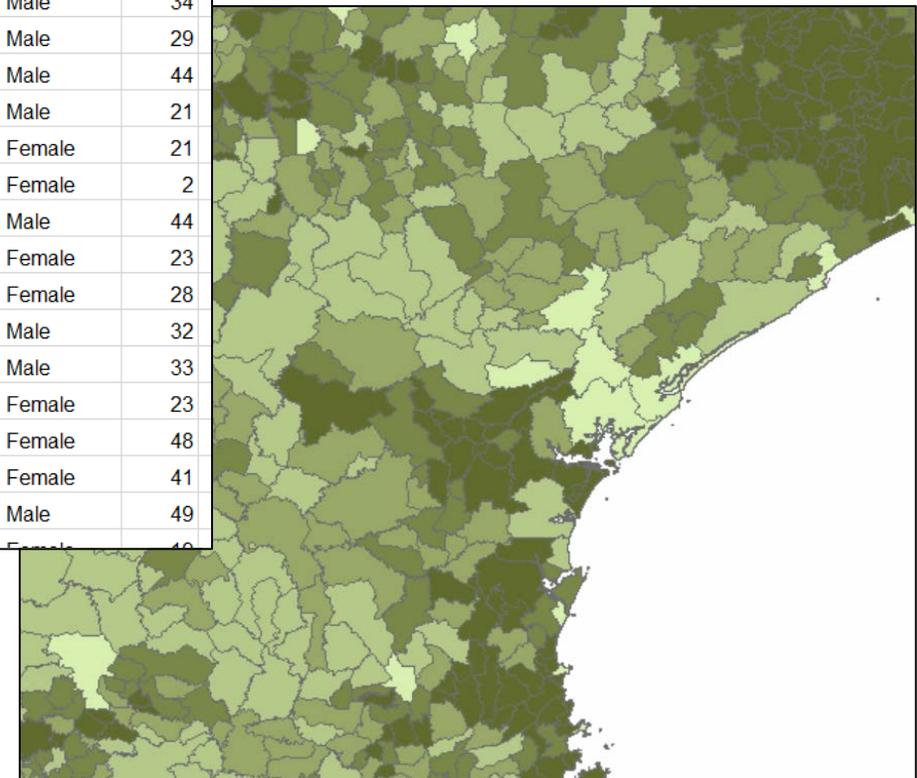
YearStart	YearEnd	LocationAbbr	LocationDesc
2001	2001	ME	Maine
2001	2001	MI	Michigan
2001	2001	MN	Minnesota
2001	2001	MO	Missouri
2001	2001	MS	Mississippi
2001	2001	MT	Montana
2001	2001	NC	North Carolina
2001	2001	ND	North Dakota
2001	2001	NE	Nebraska
2001	2001	NH	New Hampshire

shape	dseconds	location	gender	age
sk	240	Spokane,Wa	Female	28
circle	5	Las Vegas,Nv	Male	31
oval	120	Charlotte,Nc	Male	34
light	30	Seattle,Wa	Male	29
light	30	Cotati,Ca	Male	44
triangle	900	Phoenix,Az	Male	21
nevron	360	Yuma,Az	Female	21
chevron	360	Yuma,Az	Female	2
circle	30	Little Rock,Ar	Male	44
light	900	Bolingbrook,Il	Female	23
sphere	600	Phoenix,Az	Female	28
light	20	Denver,Co	Male	32
oval	300	Memphis,Tn	Male	33
triangle	120	Orlando,Fl	Female	23
other	240	Bellevue,Wa	Female	48
light	900	Atlanta,Ga	Female	41
other	3	Seattle,Wa	Male	49
light	300	Merida,Berth,Ca	Female	49

Too much irrelevant data?

11/24/04 02:00 AM	Guillen, Claudia J.	chevron	360	Yuma,Az	Female	2
5/12/06 06:00 PM	Rich, Randy L.	circle	30	Little Rock,Ar	Male	44
10/28/07 05:30 PM	Peterson, Stacy A.	light	900	Bolingbrook,Il	Female	23
3/7/08 02:00 PM	Pacheco-Flores, Rosario I.	sphere	600	Phoenix,Az	Female	28
2/26/09 08:40 PM	Pytlinski, Brian	light	20	Denver,Co	Male	32
10/1/09 06:00 PM	Stevenson, Walter S.	oval	300	Memphis,Tn	Male	33
7/1/11 10:00 PM	Elbertson, Tamara L.	triangle	120	Orlando,Fl	Female	23
11/8/11 04:40 PM	Bryden, Lorill S.	other	240	Bellevue,Wa	Female	48
6/8/12 07:00 AM	Kelley, Newanna C.	light	900	Atlanta,Ga	Female	41
5/3/13 01:05 AM	McCarthy, Christopher J.	other	3	Seattle,Wa	Male	49
12/18/13 09:00 PM	Ellis, Heather P.	light	300	Merida,Berth,Ca	Female	49

Data is not spatial?
 -- has coordinates?
 -- has addresses?
 -- has neither, but



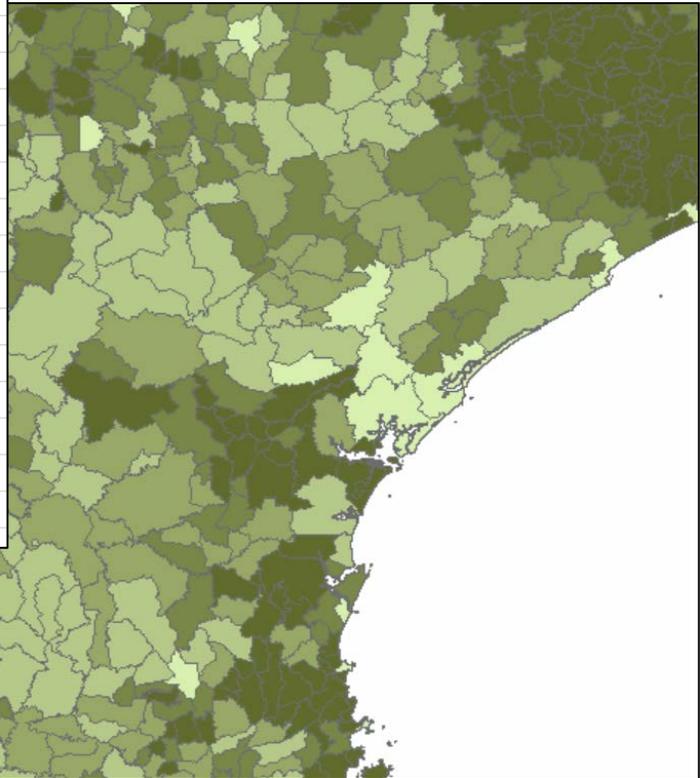
Spatial data is on the wrong spatial units or you need to combine two spatial datasets?

Data Prep Techniques

YearStart	YearEnd	LocationAbbr	LocationDesc
2001	2001	ME	Maine
2001	2001	MI	Michigan
2001	2001	MN	Minnesota
2001	2001	MO	Missouri
2001	2001	MS	Mississippi
2001	2001	MT	Montana
2001	2001	NC	North Carolina
2001	2001	ND	North Dakota
2001	2001	NE	Nebraska
2001	2001	NH	New Hampshire

ufoshape	dseconds	location	gender	age
disk	240	Spokane,Wa	Female	28
circle	5	Las Vegas,Nv	Male	31
oval	120	Charlotte,Nc	Male	34
light	30	Seattle,Wa	Male	29
light	30	Cotati,Ca	Male	44
triangle	900	Phoenix,Az	Male	21
chevron	360	Yuma,Az	Female	21
chevron	360	Yuma,Az	Female	2
circle	30	Little Rock,Ar	Male	44
light	900	Bolingbrook,Il	Female	23
sphere	600	Phoenix,Az	Female	28
light	20	Denver,Co	Male	32
oval	300	Memphis,Tn	Male	33
triangle	120	Orlando,Fl	Female	23
other	240	Bellevue,Wa	Female	48
light	900	Atlanta,Ga	Female	41
other	3	Seattle,Wa	Male	49
light	200	Murks Beach,Co	Female	40

11/24/04 02:00 AM	Guillen, Claudia J.	chevron	360	Yuma,Az	Female	2
5/12/06 06:00 PM	Rich, Randy L.	circle	30	Little Rock,Ar	Male	44
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7/1/11 10:00 PM	Elbertson, Tamara L.	triangle	120	Orlando,Fl	Female	23
11/8/11 04:40 PM	Bryden, Lorill S.	other	240	Bellevue,Wa	Female	48
6/8/12 07:00 AM	Kelley, Newanna C.	light	900	Atlanta,Ga	Female	41
5/3/13 01:05 AM	McCarthy, Christopher J.	other	3	Seattle,Wa	Male	49
12/10/13 09:00 PM	Ellis, Heather D.	light	200	Murks Beach,Co	Female	40



Too much irrelevant data?

query or “select” a subset of the data

Data table is not spatial?

- has coordinates? **plot XY coordinates**
- has addresses? **geocoding**
- has neither, but

“join” data table to a matching shapefile

Spatial data is on the wrong spatial units or you need to combine two spatial datasets?

“spatial join” two GIS layers based on location



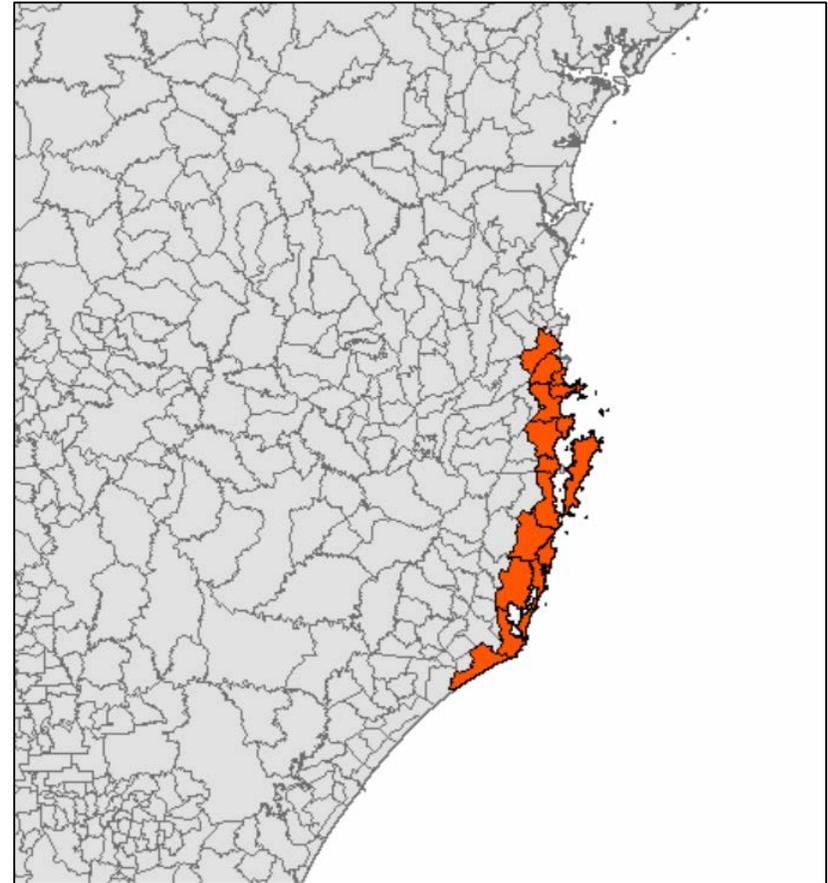
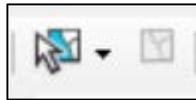
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GIS Data Queries

Why subset? Your answer will help decide on a method.

- Geographic extent is greater than needed for a small study area.
- Highlight a subregion for cartographic purposes.
- Perform analysis on a subregion.

→ Use simple point and click select.



- Subset based on attributes instead of physical location.
 - limit to certain years
 - limit to certain populations
 - include or remove features with certain characteristics
 - eliminate bad values
- Subset based on a combination of attributes.

→ Use “Select by Attribute.”



Table

AussiePublicToilets

Town	State	Postcode	Address	Male	Female	Unisex	DumpPoint	FacilityTy	ToiletType	AccessLimi	PaymentReq	KeyRequire	Acce	Parking	ParkingNot	Ac
Hindmarsh	Western Australia	6462		False	False	False	True	Other		False	False	False		False		False
Norseman	Western Australia	6443		False	False	False	True	Other		False	True	False		False		False
Northam	Western Australia	6401		False	False	False	True	Other		False	False	False		False		False
Northampton	Western Australia	6535		False	False	False	True	Other		False	False	False		False		False
Onslow	Western Australia	6710		False	False	False	True	Other		False	False	False		False		False
Carnamah	Western Australia	6517		False	False	False	True	Other		False	False	False		False		False
Macleod	Western Australia	6701		False	False	False	True	Other		False	False	False		False		False
Regans Ford	Western Australia	6507		False	False	False	True	Other		False	False	False		False		False
Bendigo	Victoria	3550	Located b	True	True	False	False	Other	Sewerage	False	True	False		False	Suitable for	False
Stradbroke	Victoria	3851		False	False	True	False	Park or reserve	Pit	True	False	False		False		False
Rosedale	Victoria	3847		False	False	True	False	Park or reserve	Pit	True	False	False		False		False

(0 out of 18865 Selected)

AussiePublicToilets latest-csv-export.csv

records

fields (attributes)

Table

AussiePublicToilets

Town	State	Postcode	Address	Male	Female	Unisex	DumpPoint	FacilityTy	ToiletType	AccessLimi	PaymentReq	KeyRequire	Acce	Parking	ParkingNot	Ac
Hindmarsh	Western Australia	6462		False	False	False	True	Other		False	False	False		False		False
Norseman	Western Australia	6443		False	False	False	True	Other		False	True	False		False		False
Northam	Western Australia	6401		False	False	False	True	Other		False	False	False		False		False
Northampton	Western Australia	6535		False	False	False	True	Other		False	False	False		False		False
Onslow	Western Australia	6710		False	False	False	True	Other		False	False	False		False		False
Carnamah	Western Australia	6517		False	False	False	True	Other		False	False	False		False		False
Macleod	Western Australia	6701		False	False	False	True	Other		False	False	False		False		False
Regans Ford	Western Australia	6507		False	False	False	True	Other		False	False	False		False		False
Bendigo	Victoria	3550	Located b	True	True	False	False	Other	Sewerage	False	True	False		False	Suitable for	False
Stradbroke	Victoria	3851		False	False	True	False	Park or reserve	Pit	True	False	False		False		False
Rosedale	Victoria	3847		False	False	True	False	Park or reserve	Pit	True	False	False		False		False

field values

(0 out of 18865 Selected)

AussiePublicToilets latest-csv-export.csv

Choose which values for which field(s) will be the basis for selection.

Select By Attributes

Layer: AussiePublicToilets

Only show selectable layers in this list

Method: Create a new selection

- "AccessLimi"
- "PaymentReq"
- "KeyRequire"
- "AccessNote"
- "Parking"

list of fields

=	<>	Like	'False'
>	>=	And	'True'
<	<=	Or	
_	%	()	
Is	In	Null	Get Unique Values

Go To:

list of available values

logical operators

SELECT * FROM AussiePublicToilets WHERE:

"KeyRequire" = 'False' AND "PaymentReq" = 'False'

Compose an expression.

Clear Verify Help Load... Save...

OK Apply Close

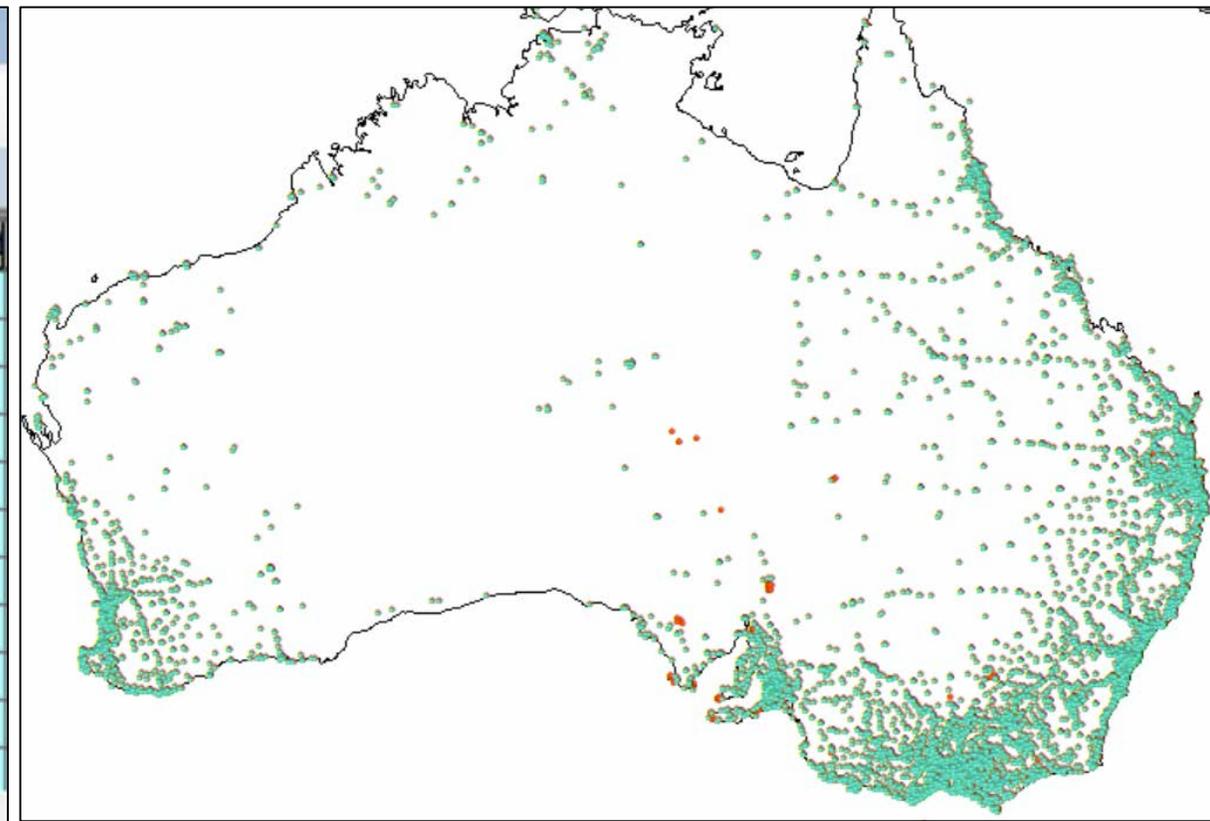
Calculator interface helps build a SQL expression to query the table.

Table

AussiePublicToilets

	AccessLimi	PaymentReq	KeyRequire	Acce	Parking	ParkingNot
▶	False	False	False		False	
	False	False	False		False	
	False	False	False		True	
	False	False	False		False	
	False	False	False		True	
	False	False	False		False	
	False	False	False		True	
	False	False	False		False	
	False	False	False		True	
	False	False	False		True	Parking is a
	False	False	False		True	

(18293 out of 18865 Selected)



Screened out 572 bathrooms that required a key or payment.

We could pare this subset down even further.

Select By Attributes

Layer: AussiePublicToilets

Only show selectable layers in this list

Method: Select from current selection

Data selection is ephemeral.

While the selection is active, tools run on the layer will only operate on the selected features.

To make several different selections or to set a symbology for a selection, you can “create layer from selected features.”

To keep a permanent copy of the selected subset for re-use, export it as a shapefile.





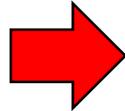
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Mapping Aspatial Data

Some interesting data are not available as GIS shapefiles or feature classes. The most common format is .csv – a simple text list with values separated by commas. If the file has fields for latitude and longitude (or X and Y coordinates), we can map the records as points.

```
CatLitterMines.csv
1 "Company Name","Executive First Name","Executive Last Name","Address","City","State","ZIP Code","Record Type","Latitude","Longitude"
2 "American Colloid Co","Ben","Grimes","Highway 31","Fort Deposit","AL","36032","Verified","031.955989","-086.554298"CRIF
3 "B H S Marketing","Doug","Massey","3450 County Road 27 # 7","Fort Lupton","CO","80621","Verified","040.049654","-104.810413"CRIF
4 "First Bentonite","Pam","Wedige","215 Teller St","Salida","CO","81201","Verified","038.529675","-105.992003"CRIF
5 "Front Range Winwater Works Co","Marvin","Moler","7006 Space Village Ave","Colorado Springs","CO","80929","Verified","038.782284","-
6 "H & H Environmental Inc","Don","Kendall","360 Teegan Ct","Grand Junction","CO","81507","Verified","039.058430","-108.640610"CRIF
7 "S & B Indl Minerals Na INC","Ed","Jessen","307 Vaughn St","Waterloo","IA","50701","Verified","042.500879","-092.365034"CRIF
8 "Carco Mineral Resources","Colby","Porter","520 Blomquist Ave","Caldwell","ID","83605","Verified","043.665679","-116.702311"CRIF
9 "Walker Water Systems Inc","Cynthia","Coffer","624 Pierce St","Twin Falls","ID","83301","Verified","042.572737","-114.463671"CRIF
10 "American Colloid Co","Jim","Papp","2870 Forbs Ave","Hoffman Estates","IL","60192","Verified","042.075812","-088.198936"CRIF
11 "Able Supply LLC","Kevin","Peterman","60005 Cinder Butte Rd","Bend","OR","97702","Verified","043.979827","-121.362829"CRIF
12 "Teague Mineral Products","April","Tyre","1925 Highway 201","Adrian","OR","97901","Verified","043.708155","-117.087746"CRIF
13 "American Colloid Co","Bill","Rhoades","10881 US Highway 212","Belle Fourche","SD","57717","Verified","044.711099","-103.892781"CRIF
14 "Bpm Minerals LLC","","","554 Highway 212","Belle Fourche","SD","57717","Verified","044.681178","-103.852281"CRIF
15 "Bentonite Performance Minerals","Jason","Bell","3000 N Sam Houston Pkwy E","Houston","TX","77032","Verified","029.935579","-095.339
16 "Redmond Minerals","Rusty","Bastain","6005 N 100 W","Redmond","UT","84652","Verified","039.005692","-111.866180"CRIF
17 "UMAI Bento","","","17306 Pacific Ave S","Spanaway","WA","98387","Verified","047.099030","-122.434370"CRIF
18 "American Colloid Co","Steve","Wilkerson","92 State Highway 37","Lovell","WY","82431","Verified","044.838162","-108.395573"CRIF
19 "Bentonite Performance Minerals","Alan","Synder","789 US Highway 14a E","Lovell","WY","82431","Verified","044.855455","-108.193901"
20 "Black Hills Bentonite","Tom","Thorson","55 Salt Creek Hwy","Casper","WY","82601","Verified","042.848795","-106.323810"CRIF
21 "Black Hills Bentonite Co","Dale","Grenier","1025 Lane 10 1/2","Worland","WY","82401","Verified","044.015207","-107.959879"CRIF
22 "M-I SWACO","Joe","Cheatham","Road 26 Lane 33","Greybull","WY","82426","Verified","044.492938","-108.053228"CRIF
23 "Tolsa Wyoming Bentonite Corp","","","12050 Bucknum Rd","Casper","WY","82604","Verified","043.020074","-106.633091"CRIF
24 "Wyo-Ben Inc","Rick","Magstadt","2700 Road 26","Greybull","WY","82426","Verified","044.598317","-108.146738"CRIF
25 "Wyo-Ben Inc","Steve","Banks","1062 Road 9","Lovell","WY","82431","Verified","044.838162","-108.395573"CRIF
```

Decide whether the coordinates are lat/lon or something else. Lat/lon values are between -180 and 180. Large numbers indicate meters or feet.



Display XY Data

A table containing X and Y coordinate data can be added to the map as a layer

Choose a table from the map or browse for another table:

CatLitterMines.csv

Specify the fields for the X, Y and Z coordinates:

X Field: Longitude

Y Field: Latitude

Z Field: <None>

Coordinate System of Input Coordinates

Description:

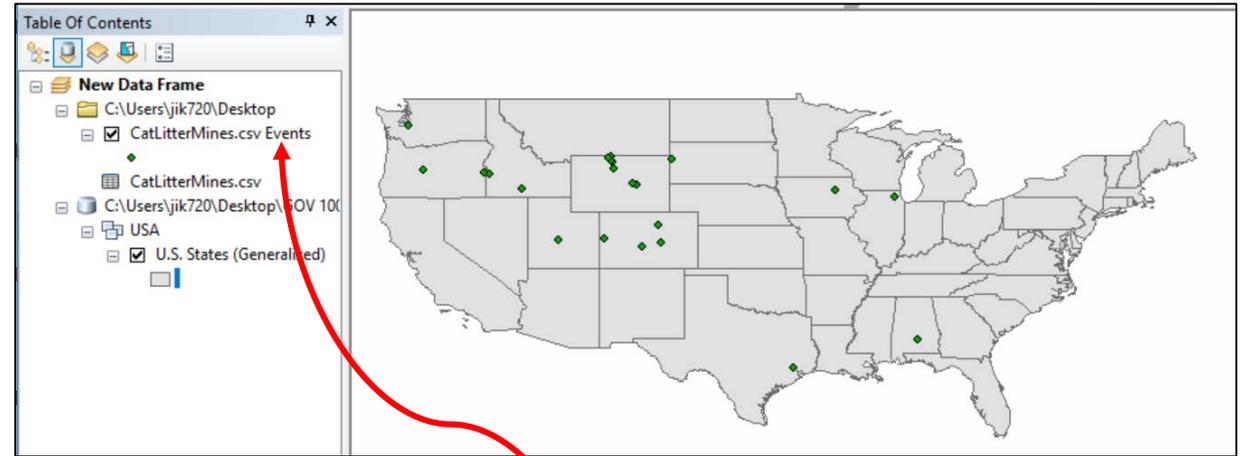
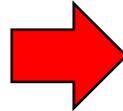
Geographic Coordinate System:
Name: GCS_WGS_1984

Show Details

Warn me if the resulting layer will have restricted functionality

[About adding XY data](#)

OK Cancel



An events layer is also ephemeral unless you export it. Most tools will not run on an events layer.

What if there are no latitudes and longitudes given? Or if we don't want the information as points?

→ IF we have a geographic layer (vector)

AND

→ IF the values in some field from the non-spatial table *exactly match* values from a field in the attribute table for the geographic layer

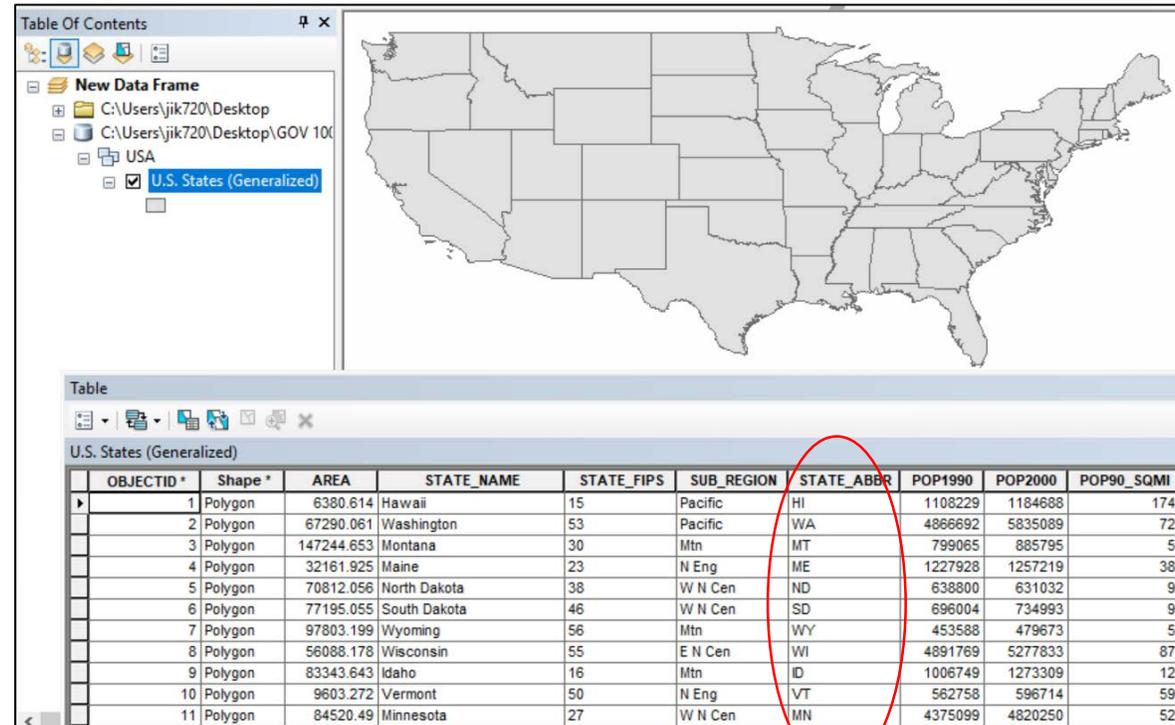
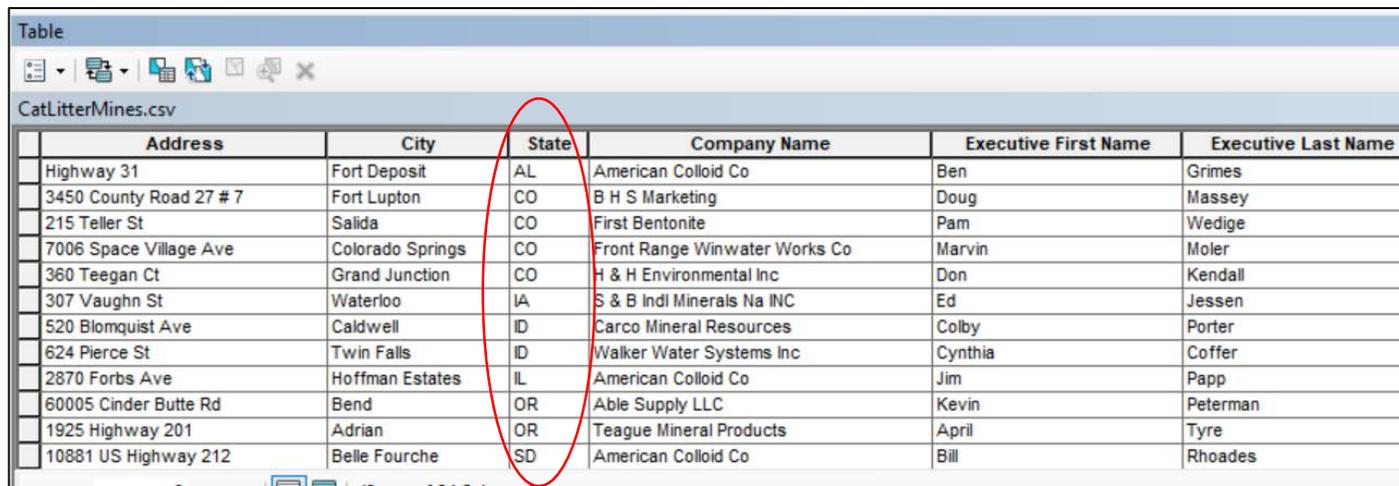


Table Of Contents

- New Data Frame
 - C:\Users\jik720\Desktop
 - C:\Users\jik720\Desktop\GOV 100
 - USA
 - U.S. States (Generalized)

OBJECTID *	Shape *	AREA	STATE_NAME	STATE_FIPS	SUB_REGION	STATE_ABBR	POP1990	POP2000	POP90_SQMI
1	Polygon	6380.614	Hawaii	15	Pacific	HI	1108229	1184688	174
2	Polygon	67290.061	Washington	53	Pacific	WA	4866692	5835089	72
3	Polygon	147244.653	Montana	30	Mtn	MT	799065	885795	5
4	Polygon	32161.925	Maine	23	N Eng	ME	1227928	1257219	38
5	Polygon	70812.056	North Dakota	38	W N Cen	ND	638800	631032	9
6	Polygon	77195.055	South Dakota	46	W N Cen	SD	696004	734993	9
7	Polygon	97803.199	Wyoming	56	Mtn	WY	453588	479673	5
8	Polygon	56088.178	Wisconsin	55	E N Cen	WI	4891769	5277833	87
9	Polygon	83343.643	Idaho	16	Mtn	ID	1006749	1273309	12
10	Polygon	9603.272	Vermont	50	N Eng	VT	562758	596714	59
11	Polygon	84520.49	Minnesota	27	W N Cen	MN	4375099	4820250	52



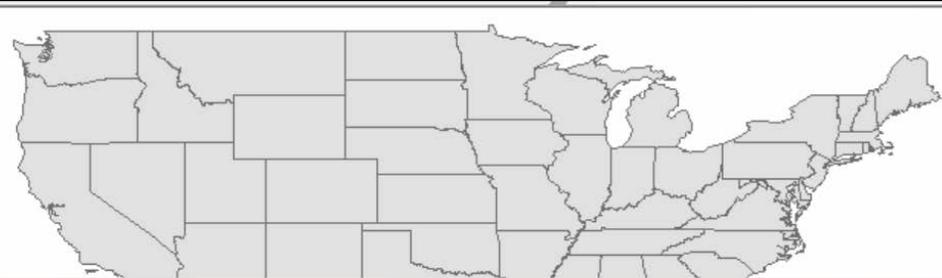
Address	City	State	Company Name	Executive First Name	Executive Last Name
Highway 31	Fort Deposit	AL	American Colloid Co	Ben	Grimes
3450 County Road 27 # 7	Fort Lupton	CO	B H S Marketing	Doug	Massey
215 Teller St	Salida	CO	First Bentonite	Pam	Wedge
7006 Space Village Ave	Colorado Springs	CO	Front Range Winwater Works Co	Marvin	Moler
360 Teegan Ct	Grand Junction	CO	H & H Environmental Inc	Don	Kendall
307 Vaughn St	Waterloo	IA	S & B Indi Minerals Na INC	Ed	Jessen
520 Blomquist Ave	Caldwell	ID	Carco Mineral Resources	Colby	Porter
624 Pierce St	Twin Falls	ID	Walker Water Systems Inc	Cynthia	Coffer
2870 Forbs Ave	Hoffman Estates	IL	American Colloid Co	Jim	Papp
60005 Cinder Butte Rd	Bend	OR	Able Supply LLC	Kevin	Peterman
1925 Highway 201	Adrian	OR	Teague Mineral Products	April	Tyre
10881 US Highway 212	Belle Fourche	SD	American Colloid Co	Bill	Rhoades

→ THEN we can “join” the two tables.

Table Of Contents

New Data Frame

- C:\Users\jik720\Desktop\GOV 100
 - USA
 - U.S. States (Generalized)
- C:\Users\jik720\Desktop
 - CatLitterMines.csv



Table

U.S. States (Generalized)

OBJECTID *	Shape *	AREA	STATE_NAME	STATE_FIPS	SUB_REGION	STATE_ABBR	POP1990	POP2000	POP90_SQMI
51	Polygon	576594.104	Alaska	02	Pacific	AK	550043	624523	1
43	Polygon	51715.786	Alabama	01	E S Cen	AL	4040587	4395481	78
47	Polygon	52913.232	Arkansas	05	W S Cen	AR	2350725	2566938	44
37	Polygon	113712.679	Arizona	04	Mtn	AZ	3665228	4894006	32
25	Polygon	157776.31	California	06	Pacific	CA	29760021	33603430	189
32	Polygon	104101.231	Colorado	08	Mtn	CO	3294394	4139027	32
19	Polygon	4976.566	Connecticut	09	N Eng	CT	3287116	3289062	661
28	Polygon	66.063	District of Columbia	11	S Atl	DC	606900	513618	9187
29	Polygon	2054.586	Delaware	10	S Atl	DE	666168	762227	324
49	Polygon	55814.731	Florida	12	S Atl	FL	12937926	15341185	232
45	Polygon	58629.222	Georgia	13	S Atl	GA	6478216	7950119	110
1	Polygon	6380.614	Hawaii	15	Pacific	HI	1108229	1184688	174

0 (0 out of 51 Selected)

When joining data, one table stays intact.

This is the left-hand table, called the **target layer**.

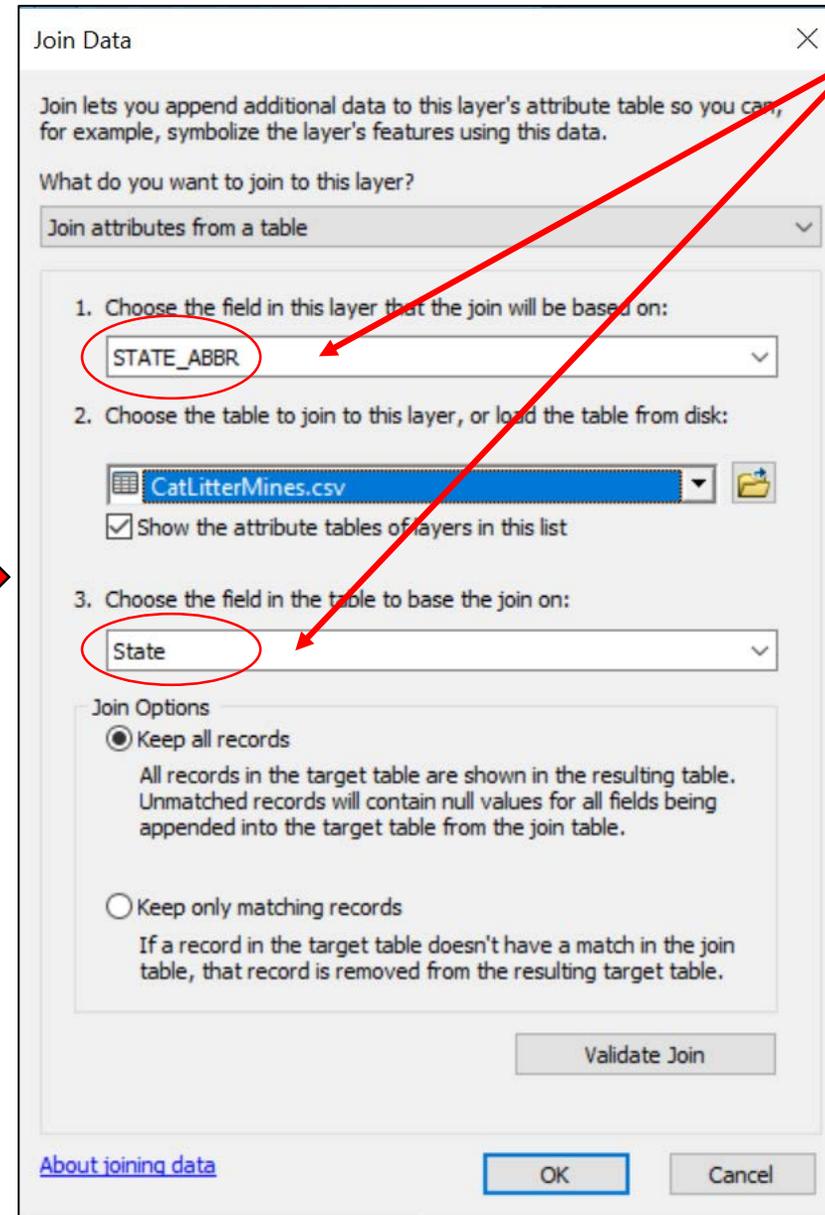
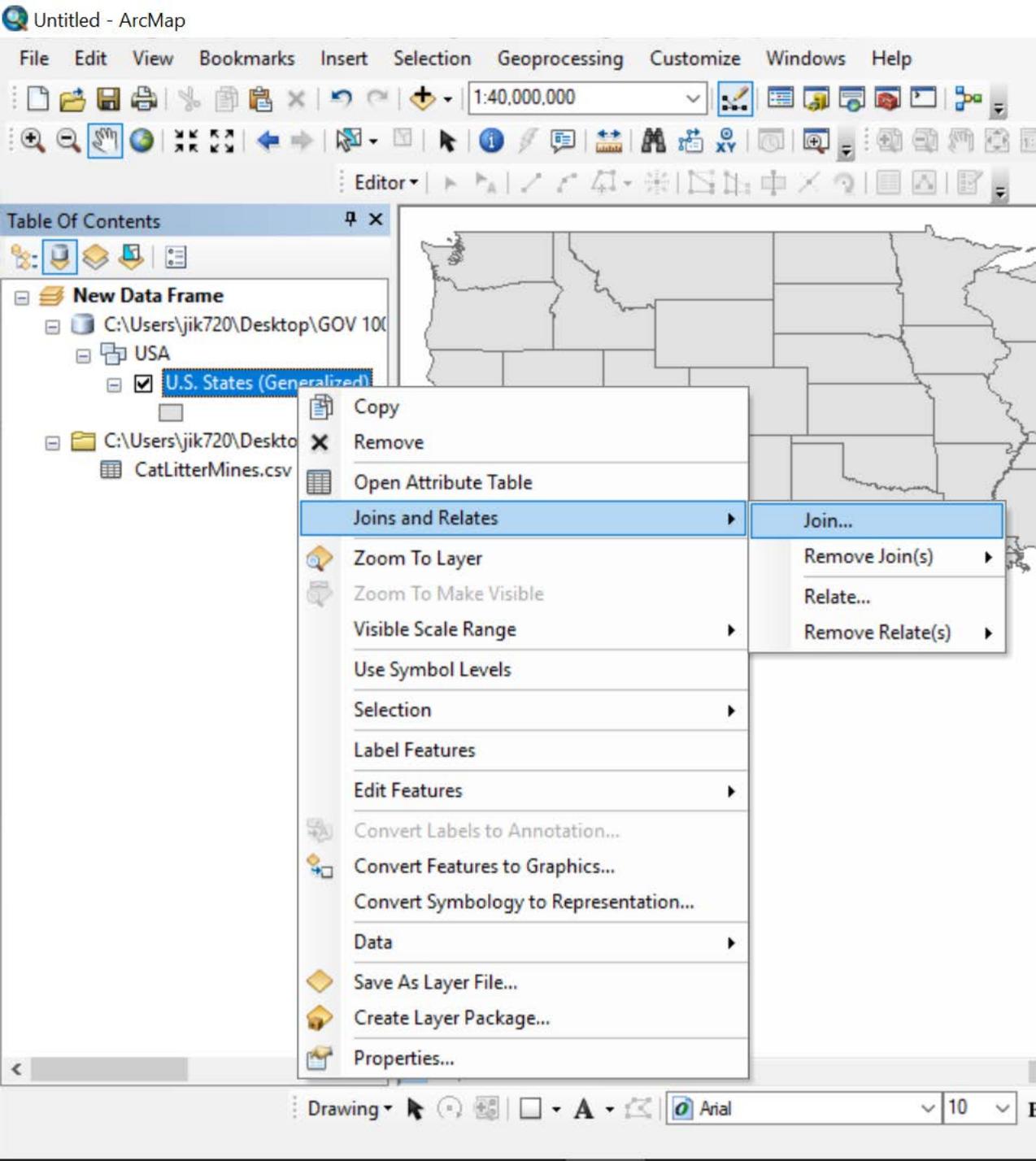
Highway 31	Fort Deposit	AL	American Colloid Co	Ben	Grimes	36032	Verified
------------	--------------	----	---------------------	-----	--------	-------	----------

215 Teller St	Salida	CO	First Bentonite	Pam	Wedge	81201	Verified
7006 Space Village Ave	Colorado Springs	CO	Front Range Winwater Works Co	Marvin	Moler	80929	Verified
360 Teegan Ct	Grand Junction	CO	H & H Environmental Inc	Don	Kendall	81507	Verified

The other table gets chopped apart and matched to the target layer.

This is the right-hand table, called the **join layer**.

After the join, records from the target layer get extra columns containing the relevant information from the join table.



The fields that match exactly are called the join key.

Table

U.S. States (Generalized)

Shape *	AREA	STATE_NAME	STAT	SUB_REGI	STA	POP1990	POP2000	POP9	Company Name	Execut	Executive	Address	City	State	ZIP Code	Record Type
Polygon	6380.614	Hawaii	15	Pacific	HI	1108229	1184688	174	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Polygon	67290.061	Washington	53	Pacific	WA	4866692	5835089	72	UMAI Bento	<Null>	<Null>	17306 Pacific Ave S	Spanaway	WA	98387	Verified
Polygon	147244.653	Montana	30	Mtn	MT	799065	885795	5	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Polygon	32161.925	Maine	23	N Eng	ME	1227928	1257219	38	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Polygon	70812.056	North Dakota	38	W N Cen	ND	638800	631032	9	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Polygon	77195.055	South Dakota	46	W N Cen	SD	696004	734993	9	American Colloid Co	Bill	Rhoades	10881 US Highway 212	Belle Fourche	SD	57717	Verified
Polygon	97803.199	Wyoming	56	Mtn	WY	453588	479673	5	American Colloid Co	Steve	Wilkerson	92 State Highway 37	Lovell	WY	82431	Verified
Polygon	56088.178	Wisconsin	55	E N Cen	WI	4891769	5277833	87	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Polygon	83343.643	Idaho	16	Mtn	ID	1006749	1273309	12	Carco Mineral Resources	Colby	Porter	520 Blomquist Ave	Caldwell	ID	83605	Verified
Polygon	9603.272	Vermont	50	N Eng	VT	562758	596714	59	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Polygon	84520.49	Minnesota	27	W N Cen	MN	4375099	4820250	52	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Polygon	97073.594	Oregon	41	Pacific	OR	2842321	3356108	29	Able Supply LLC	Kevin	Peterman	60005 Cinder Butte Rd	Bend	OR	97702	Verified

U.S. States (Generalized)

(0 out of 51 Selected)

New fields from joined table, nulls where there was no match.



Joined tables are also ephemeral, and joins are easy to remove. If you will need to use the joined layer repeatedly, be sure to export.

*Note that this join was “one-to-one.” The states layer still has 51 records. Where there were duplicates, the first record was chosen. There are ways to join one-to-many and many-to-one.

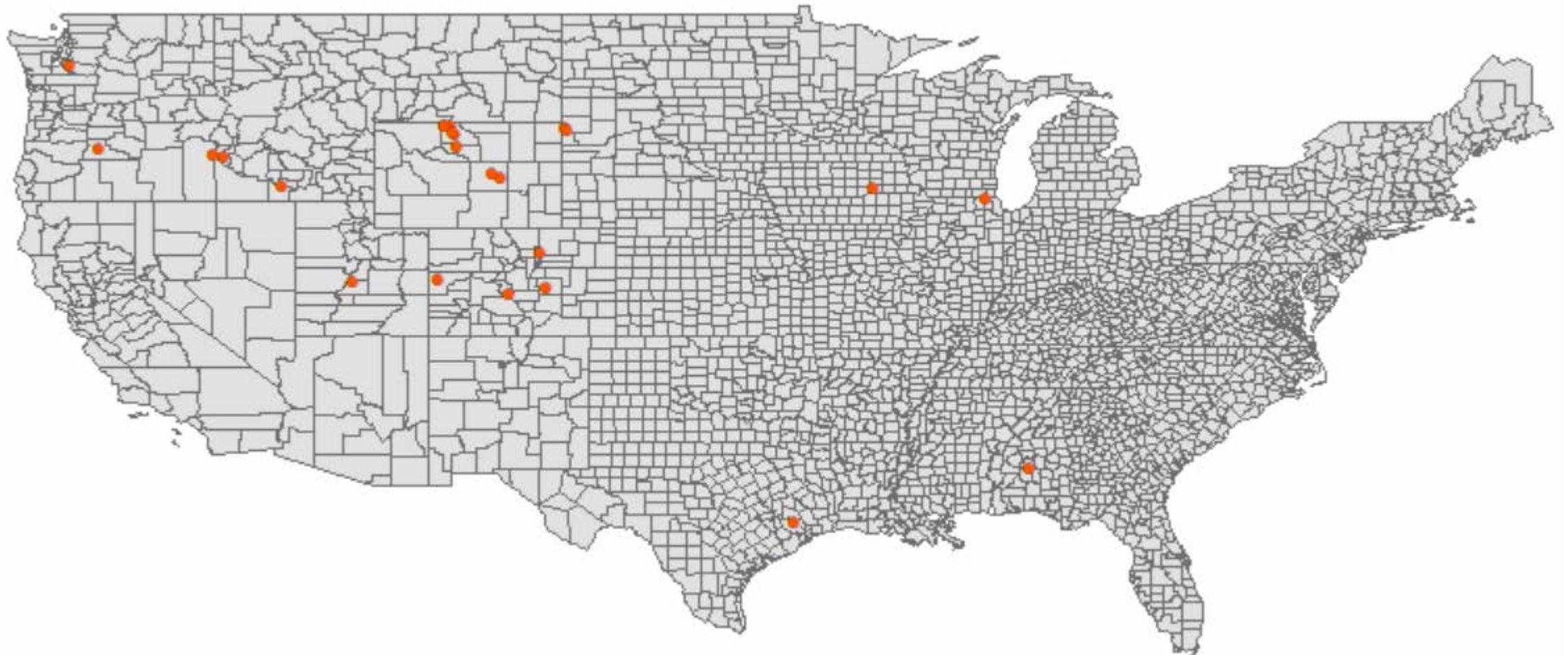


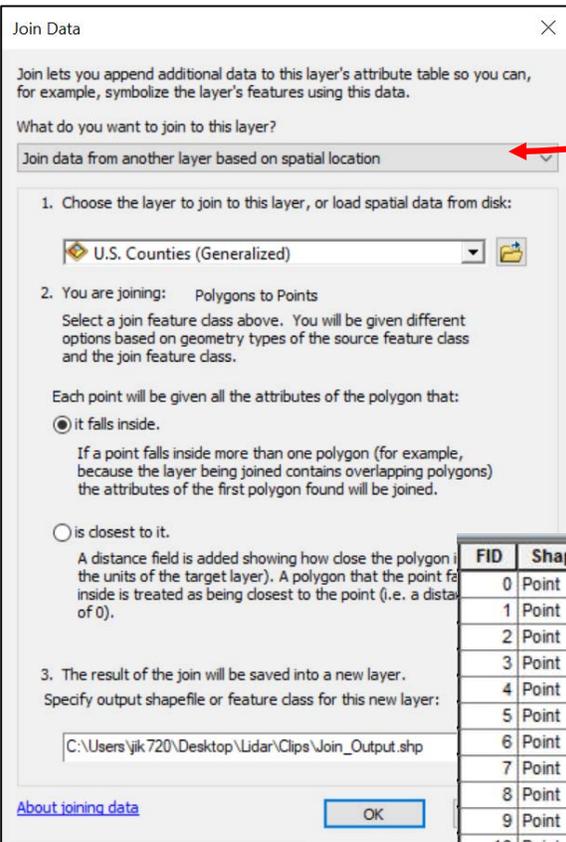
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Spatial Joins

Sometimes it can be helpful to join two spatial layers together, based on the spatial locations of their features.

For example, it might be useful to know which county each mine is in. Or, we might want to know which counties have a mine and how many.



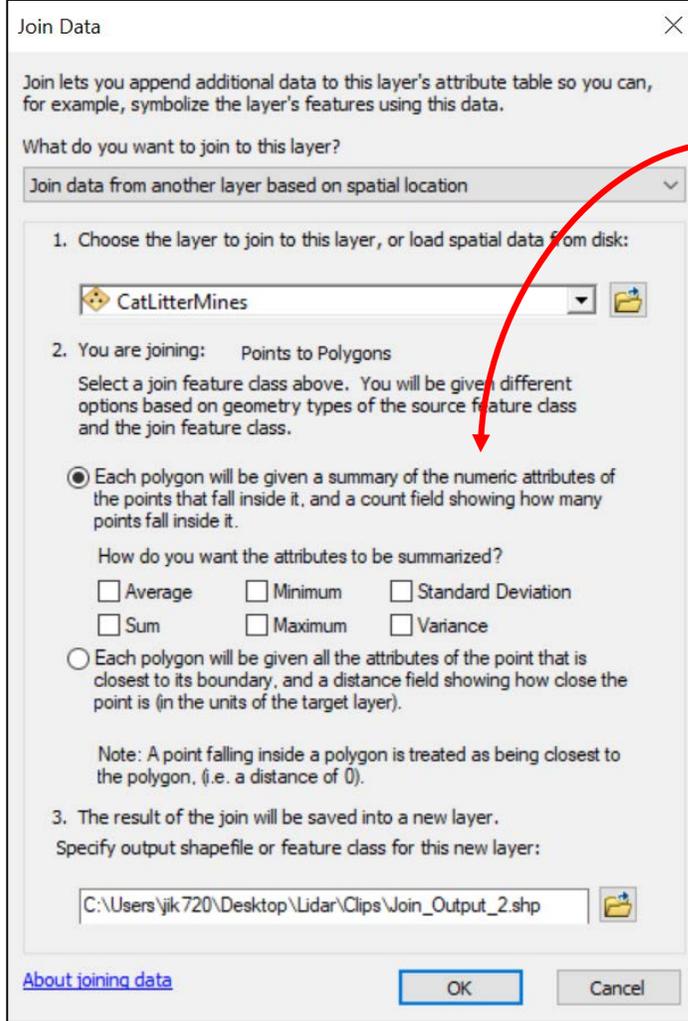


In ArcMap, the join dialog box has a spatial option. There is also a toolbox tool for Spatial Join.

When the points are used as the target layer (left-hand), new fields are added showing which county each falls in.

This join is many-to-one -- several mines are joined to the same county, with duplicate copies of the county record.

FID	Shape	FID_1	Company_Na	Executive	Executiv_1	Address	City	State	ZIP_Code	OBJECTID	NAME	STATE_NAME	STATE	CNTY	FIPS	AREA
0	Point	15	UMAI Bento			17306 Pacific Ave S	Spanaway	WA	98387	109	Pierce	Washington	53	053	53053	1651.7448
1	Point	11	American Colloid Co	Bill	Rhoades	10881 US Highway 212	Belle Fourche	SD	57717	266	Butte	South Dakota	46	019	46019	2254.2821
2	Point	12	Bpm Minerals LLC			554 Highway 212	Belle Fourche	SD	57717	266	Butte	South Dakota	46	019	46019	2254.2821
3	Point	16	American Colloid Co	Steve	Wilkerson	92 State Highway 37	Lovell	WY	82431	286	Big Horn	Wyoming	56	003	56003	3177.1241
4	Point	17	Bentonite Performance Minerals	Alan	Synder	789 US Highway 14a E	Lovell	WY	82431	286	Big Horn	Wyoming	56	003	56003	3177.1241
5	Point	20	M-I SWACO	Joe	Cheatham	Road 26 Lane 33	Greybull	WY	82426	286	Big Horn	Wyoming	56	003	56003	3177.1241
6	Point	22	Wyo-Ben Inc	Rick	Magstadt	2700 Road 26	Greybull	WY	82426	286	Big Horn	Wyoming	56	003	56003	3177.1241
7	Point	23	Wyo-Ben Inc	Steve	Banks	1062 Road 9	Lovell	WY	82431	286	Big Horn	Wyoming	56	003	56003	3177.1241
8	Point	10	Teague Mineral Products	April	Tyre	1925 Highway 201	Adrian	OR	97901	346	Malheur	Oregon	41	045	41045	9884.2433
9	Point	9	Able Supply LLC	Kevin	Peterman	60005 Cinder Butte Rd	Bend	OR	97702	349	Deschutes	Oregon	41	017	41017	3051.1469
10	Point	19	Black Hills Bentonite Co	Dale	Grenier	1025 Lane 10 1/2	Worland	WY	82401	378	Washakie	Wyoming	56	043	56043	2233.3898
11	Point	6	Carco Mineral Resources	Colby	Porter	520 Blomquist Ave	Caldwell	ID	83605	399	Canyon	Idaho	16	027	16027	603.2971
12	Point	18	Black Hills Bentonite	Tom	Thorson	55 Salt Creek Hwy	Casper	WY	82601	435	Natrona	Wyoming	56	025	56025	5348.6869
13	Point	21	Tolsa Wyoming Bentonite Corp			12050 Bucknum Rd	Casper	WY	82604	435	Natrona	Wyoming	56	025	56025	5348.6869
14	Point	7	Walker Water Systems Inc	Cynthia	Coffer	624 Pierce St	Twin Falls	ID	83301	506	Twin Falls	Idaho	16	083	16083	1908.7654
15	Point	5	S & B Indl Minerals Na INC	Ed	Jessen	307 Vaughn St	Waterloo	IA	50701	533	Black Hawk	Iowa	19	013	19013	575.4181
16	Point	1	B H S Marketing	Doug	Massey	3450 County Road 27 # 7	Fort Lupton	CO	80621	792	Weld	Colorado	08	123	08123	4063.1763
17	Point	4	H & H Environmental Inc	Don	Kendall	360 Teegan Ct	Grand Junction	CO	81507	1168	Mesa	Colorado	08	077	08077	3326.245
18	Point	3	Front Range Winwater Works Co	Marvin	Moler	7006 Space Village Ave	Colorado Springs	CO	80929	1231	El Paso	Colorado	08	041	08041	2116.2196
19	Point	2	First Bentonite	Pam	Wedige	215 Teller St	Salida	CO	81201	1248	Chaffee	Colorado	08	015	08015	1007.8322
20	Point	14	Redmond Minerals	Rusty	Bastain	6005 N 100 W	Redmond	UT	84652	1252	Sevier	Utah	49	041	49041	1926.8975
21	Point	0	American Colloid Co	Ben	Grimes	Highway 31	Fort Deposit	AL	36032	2623	Butler	Alabama	01	013	01013	781.8795



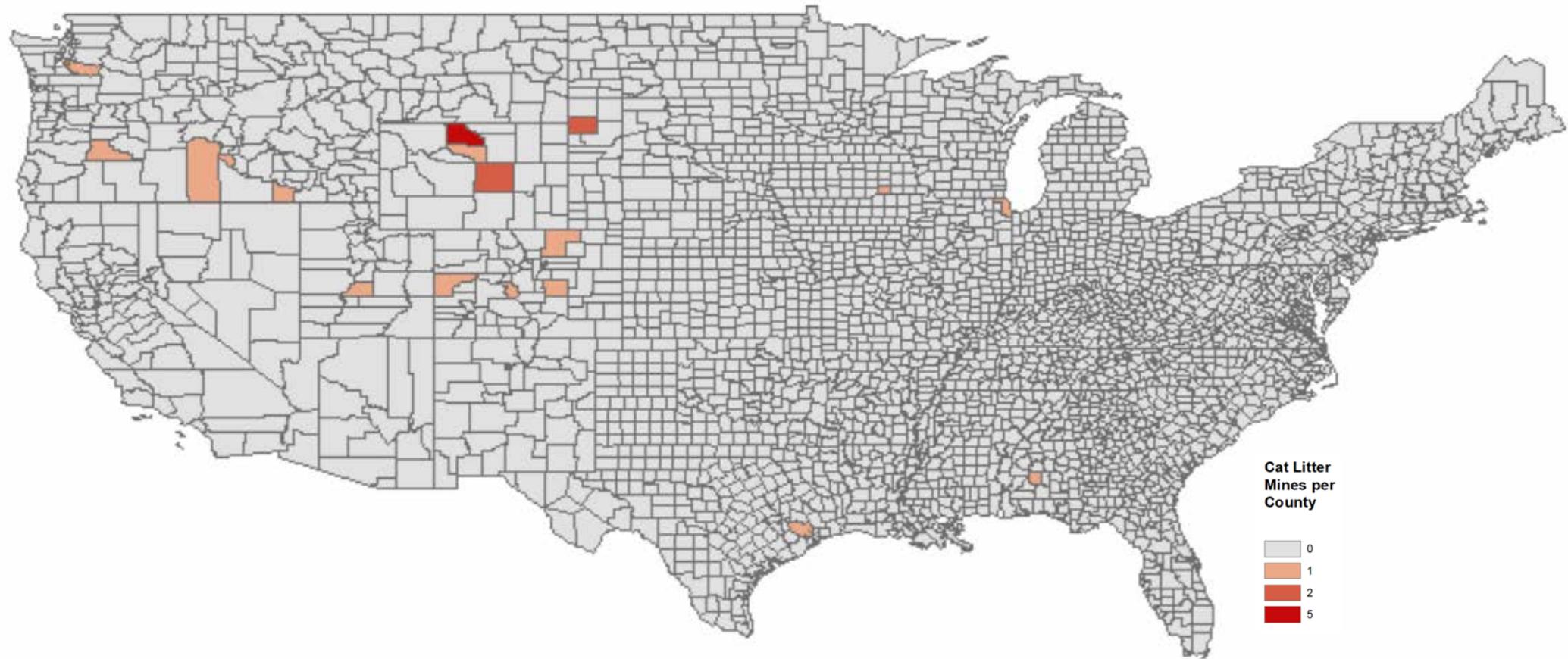
When the county polygons are used as the target layer, new choices have to be made.

New fields are added to the counties, including a count of how many cat litter mines each county contained, and most unhelpfully, the average zip code and coordinates of the mine. Be careful when you ask for statistics!!

This join is one-to-many, where the many mines are summarized to one value per county.

FID	Shape	OBJECT	NAME	STATE_NAME	STAT	CNTY	FIPS	AREA	POP1990	POP2000	POP90_SQ	Count_	Avg_ZIP_Co	Avg_Latitu	Avg_Longit
285	Polygon	286	Big Horn	Wyoming	56	003	56003	3177.1241	10525	11222	3	5	82429	44.724607	-108.237003
265	Polygon	266	Butte	South Dakota	46	019	46019	2254.2821	7914	8686	4	2	57717	44.696139	-103.872531
434	Polygon	435	Natrona	Wyoming	56	025	56025	5348.6869	61226	63021	11	2	82602.5	42.934435	-106.47845
108	Polygon	109	Pierce	Washington	53	053	53053	1651.7448	586203	700858	355	1	98387	47.09903	-122.43437
345	Polygon	346	Malheur	Oregon	41	045	41045	9884.2433	28038	28480	3	1	97901	43.708155	-117.087746
348	Polygon	349	Deschutes	Oregon	41	017	41017	3051.1469	74958	115342	25	1	97702	43.979827	-121.362829
377	Polygon	378	Washakie	Wyoming	56	043	56043	2233.3898	8388	8496	4	1	82401	44.015207	-107.959879
398	Polygon	399	Canyon	Idaho	16	027	16027	603.2971	90076	128486	149	1	83605	43.665679	-116.702311
505	Polygon	506	Twin Falls	Idaho	16	083	16083	1908.7654	53580	63800	28	1	83301	42.572737	-114.463671
532	Polygon	533	Black Hawk	Iowa	19	013	19013	575.4181	123798	119540	215	1	50701	42.500879	-92.365034
791	Polygon	792	Weld	Colorado	08	123	08123	4063.1763	131821	171203	32	1	80621	40.049654	-104.810413
1167	Polygon	1168	Mesa	Colorado	08	077	08077	3326.245	93145	117425	28	1	81507	39.05843	-108.64061
1230	Polygon	1231	El Paso	Colorado	08	041	08041	2116.2196	397014	509408	188	1	80929	38.782284	-104.613156
1247	Polygon	1248	Chaffee	Colorado	08	015	08015	1007.8322	12684	15913	13	1	81201	38.529675	-105.992003
1251	Polygon	1252	Sevier	Utah	49	041	49041	1926.8975	15431	18968	8	1	84652	39.005692	-111.86618
2622	Polygon	2623	Butler	Alabama	01	013	01013	781.8795	21892	21424	28	1	36032	31.955989	-86.554298
2822	Polygon	2823	Harris	Texas	48	201	48201	1741.4574	2818199	3302269	1618	1	77032	29.935579	-95.339854
3085	Polygon	3086	Cook	Illinois	17	031	17031	964.9506	5105067	5192969	5290	1	60192	42.075812	-88.198936
0	Polygon	1	Lake of the Woods	Minnesota	27	077	27077	1784.0634	4076	4651	2	0	0	0	0
1	Polygon	2	Ferry	Washington	53	019	53019	2280.2319	6295	7199	3	0	0	0	0
2	Polygon	3	Stevens	Washington	53	065	53065	2529.9794	30948	40652	12	0	0	0	0
3	Polygon	4	Okanogan	Washington	53	047	53047	5306.18	33350	38640	6	0	0	0	0
4	Polygon	5	Pend Oreille	Washington	53	051	53051	1445.0286	8915	11752	6	0	0	0	0

The “count” field allows us to symbolize the map to show the abundance of cat litter mines by county.



*Note: in ArcMap, the output of a Spatial Join is durable – a new saved shapefile.

